WHAT IS CLAIMED IS

... A fractionation device for separating solutes or some of the solutes in a raw liquid by a membrane comprising

1) a supply part for loading the raw liquid;

2) a filtration part for filtering some of the solutes in the raw liquid sent from the supply part;

3) a concentration part for concentrating the filtrate from the filtration part; and

4) a flow pump for sending a mobile phase introduced into the device at the time of fractionation, wherein a circuit composed of the filtration part, the concentration part, and a flow channel connecting the filtration part and the concentration part is a closed circuit.

.2. The fractionation device as claimed in claim 1 further comprising

5) a recovery part for recovering the concentrated solution obtained in the concentration part, wherein a circuit composed of the supply part, the filtration part, and a flow channel connecting the supply part and the filtration part and a pipeline composed of the concentration part, the recovery part, and a flow channel connecting the concentration part and the recovery part are respectively closed circuit.

.3. The fractionation device as claimed in claim 2, wherein the total inner capacity of the closed circuits is 50 mL or lower.

.4. The fractionation device as claimed in claim 2, wherein a filtration apparatus is employed for the filtration part and the concentration part each.

.5. The fractionation device as claimed in claim 4, wherein the filtration apparatus is a module having hollow fiber membranes.

.6. The fractionation device as claimed in claim 5, wherein the flow channel connecting the supply part and the filtration part is provided with a pump.

.7. The fractionation device as claimed in claim 6, wherein the recovery part is a container for sampling a concentrated liquid.

.8. The fractionation device as claimed in claim 7, wherein a buffer part for buffering the volumetric alteration at the time of loading the raw liquid is installed at any position in the circuit.

.9. The fractionation device as claimed in claim 7, wherein at least a portion of the circuit composed of the supply part, the filtration part, the concentration part, the recovery part, and flow channels connecting the respective parts is assembled in a cartridge.

.10. The fractionation device as claimed in claim 8, wherein the flow pump is a tube pump provided with a rotating rotor and a roller installed in a rotating manner in the outer

circumference of the rotor and a portion of the outer wall of the cartridge is a squeezing member for squeezing a part of the flow channels of the circuit.

.11. The fractionation device as claimed in claim 10, wherein the fractionation device is provided with a transportation mechanism for transporting the cartridge in the direction to and from the rotor of the roller type tube pump to squeeze a flow pipe.

.12. The fractionation device as claimed in one of claims 1 to 11, wherein the raw liquid is a body fluid or a biological component-containing solution.

.13. A fractionation device comprising a cartridge and a roller type tube pump for separating solutes or some of the solutes in a raw liquid by a membrane, wherein the cartridge comprises at least a portion of a circuit having at least a supply part for loading the raw liquid, means connected with the supply part by a flow channel for fractionating solutes of the raw liquid by a membrane, and a recovery part connected with the means for fractionating the solutes for recovering the fractionated solutes and the circuit is a closed circuit and a part of the outer wall of the cartridge is a squeezing member for squeezing the tube of the roller type tube pump and a part of the circuit is formed in a part of the outer wall of the squeezing member.

.14. A circuit of a fractionation device for separating solutes or some of the solutes from a raw liquid by a membrane, including at least a portion comprising a supply part for loading the raw liquid, means connected with the supply part by a flow channel for fractionating solutes of the raw liquid by a membrane, and a recovery part connected with the means for fractionating the solutes for recovering the fractionated solutes in a cartridge, and being characterized in that the circuit is a closed circuit and a part of the outer wall of the cartridge forms a squeezing member and a tube forming a part of the circuit is installed in a portion of the outer wall of the squeezing member.

.15. A biological component separation method for separating some of biological components by supplying a biological component-derived sample to an antibody-adsorbing-membrane separation system containing, in a middle or a rear part of the membrane separation system, an antibody capable of adsorbing specified proteins and having a permeation ratio of human α_1 microglobulin and human albumin (permeability of human α_1 microglobulin/permeability of human albumin) in a range from 1.5 or higher to 1000 or lower under a condition that no antibody adsorbing proteins exists in the system, wherein the concentration of proteins obtained by the separation is 10% or lower in 100% concentration achieved by the membrane separation system in the condition that no antibody exists.

.16. The biological component separation method as claimed in

claim 16, wherein the specified proteins are serum albumin, immunoglobulin G, immunoglobulin A, immunoglobulin M, transferrin, haptoglobin, α_1-antitrypsin, α_2-macroglobulin, α_1-acid glycoprotein, fibrinogen, complement C1q, complement C3, complement C4, complement C8, complement C9, complement factor B, apolipoprotein A, apolipoprotein B, Lp(a), collagen, myosin, actin, cytokeratin, keratin, and/or fibronectin.

.17.The biological component separation method as claimed in claim 16, wherein the antibody is polyclonal antibody, monoclonal, or their fragments containing the antigen recognition sites.

.18. The biological component separation method as claimed in claim 17, wherein the antibody is fixed in the membrane surface of the membrane separation system.

.19. The biological component separation method as claimed in claim 18, wherein the membrane separation system comprises columns containing separation membranes therein and arranged in multi-step in series and the antibody is fixed in the surface in the raw liquid side of the separation membrane of the column in the first stage.

.20. The biological component separation method as claimed in claim 19, wherein the membrane separation system comprises columns containing separation membranes therein and arranged in multi-step in series and the antibody is fixed in the surface

in the permeation side of the separation membrane of the column in the first stage.

.21. The biological component separation method as claimed in one of claims 18 to 20, wherein the membrane separation system comprises columns containing separation membranes therein and arranged in multi-step in series and the antibody exists in the mobile phase in the flow channel between the membrane of the column in a prior stage and the membrane of the column in a posterior stage.

.22. The biological component separation method as claimed in claim 21, wherein the membrane separation system comprises columns containing separation membranes therein and arranged in multi-step in series and the antibody is fixed in the flow channel between the membrane of the column in a prior stage and the membrane of the column in a posterior stage.

.23. A biological component separation apparatus comprising a membrane separation apparatus having the permeation ratio of human α_1 microglobulin and human albumin in a range from 2 or higher and 1000 or lower and an antibody treatment apparatus containing an antibody in the middle or in the rear side of the flow channel of the membrane separation apparatus.

.24. A protein fractionation method for fractionating proteins by bringing a solution containing a plurality of kinds of proteins and water into contact with a hollow fiber separation

membrane, wherein the solution to be subjected to the fractionation contains an organic solvent.

.25. The protein fractionation method as claimed in claim 24, wherein the content of the organic solvent is 1% by volume or higher and less than 20% by volume.

.26. The protein fractionation method as claimed in claim 25, wherein the organic solvent is acetonitrile.

.27. The protein fractionation method as claimed in one of claims 24 to 26, wherein the fractionation is carried out at 30°C or lower.